

Part 1 General

1.1 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Grubbing consists of excavation and disposal of stumps and roots to not less than specified depth below existing ground surface.

1.2 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures. Refer to Section 01 35 43 – Environmental Procedures.
- .2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

- .1 Notify Departmental Representative immediately of damage to or when unknown existing utility line(s) are encountered.
- .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
- .2 Clear as indicated. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000mm above ground surface.
- .3 Cut off branches and cut down trees overhanging area cleared.

3.4 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.

3.5 GRUBBING

- .1 Remove and dispose of roots, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 300 mm below ground surface.

3.6 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site.
 - .1 Do not burn or bury cleared and grubbed material on site.

3.7 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for stripping of topsoil.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS:

- .1 Section 03 30 00 – Cast-In-Place Concrete.
- .2 Section 05 51 29 – Metal Stairs and Ladders.
- .3 Section 32 11 23 - Aggregate Base Course.
- .4 Section 33 11 16 - Site Water Utility Distribution Piping.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D 698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .3 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 8.2-M88-CAN/CGSB Sieves, Testing, Woven Wire, Metric
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 416-13 Construction Specification for Pipeline and Utility Installation by Jacking and Boring.
 - .2 OPSS 450-07 Construction Specification for Pipeline and Utility Installation in Soil by Horizontal Directional Drilling.
 - .3 OPSS 1802-08 Material Specification for Smooth Walled Steel Pipe.
 - .4 OPSS 1010.MUNI-13 Material Specification for Aggregates – Granular A, B, M and Select Subgrade Material.
 - .5 OPSS 1802-08 Material Specification for Smooth Walled Steel Pipe.
- .4 The Master Painters Institute (MPI)
 - .1 Structural Steel and Metal Fabrications-07.
 - .1 EXT 5.1D Alkyd gloss finish.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock : any solid material in excess of 1.00m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material is not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil:

- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Approved Native Backfill: excavated site material, free of construction debris, with no stones or rubble larger than 200mm, approved for re-use by Departmental Representative.
- .5 Unsuitable materials:
 - .1 Excessively wet material which can not achieve indicated compaction.
 - .2 Weak and compressible materials under excavated areas.
 - .3 Frost susceptible materials under excavated areas.
 - .4 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136 : CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .5 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority.

1.5 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to beginning excavation Work, notify applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations in advance of main work.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

- .5 Where unknown utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Departmental Representative.
- .6 Record location of maintained, re-routed and abandoned underground lines.
- .7 Confirm locations of recent excavations adjacent to area of excavation.

1.6 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work establish location of buried services on and adjacent to site.

Part 2 Products

2.1 MATERIALS

- .1 Granular Base material, refer to Section 32 11 23 – Aggregate Base Course
- .2 Type 1 Fill:
 - .1 Approved Native Backfill or select subgrade to OPSS.MUNI 1010.
- .3 Bollard: steel pipe refer to section 05 51 29 – Metal Stairs and Ladders
 - .1 Schedule 40 pipe, size as indicated.
 - .2 Concrete embedment material: site concrete, refer to section 03 30 00 – Cast-In-Place Concrete.
 - .3 Paint: MPI EXT 5.1D, alkyd, gloss finish, colour: yellow.
- .4 Steel casing pipe: to OPSS 1802 complete with welded joints.
- .5 Grout: refer to section 03 30 00 – Cast-in-Place Concrete.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures. Refer to Section 01 35 43 – Environmental Procedures.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 STOCKPILING

- .1 Stockpile fill materials in area indicated.
 - .1 Stockpile granular materials in manner to prevent segregation.

- .2 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies, refer to Section 01 35 43 – Environmental Procedures.

3.4 SHORING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Engage Services of qualified Professional Engineer who is registered or licensed in the province of Ontario to design and inspect shoring, bracing and underpinning required for work.
- .3 During backfill operation:
 - .1 Remove shoring from excavations.

3.5 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .4 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.6 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Do not disturb soil or rock below bearing surfaces.
- .3 Remove concrete, paving, and rubble and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15m at end of day's operation.
 - .1 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.

- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .12 Obtain Departmental Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed Departmental Representative.
- .14 Correction of unauthorized over-excavation:
 - .1 Excavations taken below depths shown without Departmental Representative's written authorization to be filled with granular base material compacted to 95% of maximum density obtained from ASTM D98, refer to Section 32 11 23 – Aggregate Base Course at Contractor's expense.
- .15 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.7 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated. Compaction densities are percentages of maximum densities obtained from ASTM D698 .
 - .1 Type 1 Fill: to underside of granular sub-base and granular base. Compact to 95%.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in:
 - .1 Section 33 11 16 – Site Water Utility Distribution Piping.
- .2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of shoring and bracing; backfilling of voids.
 - .5 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .2 Do not use backfill material which is frozen or contains ice, snow or debris.
- .3 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

- .4 Backfilling around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Place layers simultaneously on both sides of installed Work to equalize loading.

3.10 TRENCHLESS PIPE INSTALLATION

- .1 Horizontal Directional Drilling Pipe Installation
 - .1 Use directional drilling equipment equipped with:
 - .1 A fluid mixing and delivery system of sufficient capacity for intended use. Use clean water and only non-hazardous additives, free on any clumps.
 - .2 A guidance system to accurately guide the boring operation, vertically and horizontally.
 - .3 A system to monitor and record maximum pull back pressure.
 - .4 Sufficient number of pipe rollers to prevent excessive pipe sag.
 - .2 Drill pilot hole in advance of pipe pulling. Report any deviation in vertical or horizontal alignment to the Departmental Representative and await approval to proceed. Deviations in excess of allowable tolerances will require re-drilling of the pilot hole, until pilot hole alignment is true to within specified tolerances.
 - .3 Tolerances:
 - .1 Watermains: installed at a minimum 2.4m cover, but no greater than 2.7m, unless otherwise noted.
 - .2 Deviation of pipe center line from horizontal alignment:
 - .1 Not to exceed 600mm offset.
 - .2 To be free of switchbacks of 200mm or greater amplitude and at no time result in pipe deflections that are greater than 1.5x the minimum pipe manufacturer's bend radius .
 - .4 Upon completion and approval of pilot hole, ream and pull back pipe in accordance with OPSS 450. Pull-back operations shall continue without interruption until the pipe is completely installed.
 - .5 Do not exceed the pipe manufacturer's safe pulling force.
 - .6 Horizontal Directional Drilling will not be permitted through areas of bedrock.
- .2 Jack And Bore Pipe Installation
 - .1 Excavate launching and receiving pit.
 - .2 Do jack and bore pipe installation in accordance with OPSS 416.
 - .3 Casing pipe: thickness sufficient to support all boring forces during installation.
 - .1 Size of casing to be sufficient to house carrier pipe with appropriate annular space clearances to account for deviations in casing pipe installation while still permitting carrier pipe to be installed to indicated grades and inverts.
 - .2 Annular space between carrier pipe and casing to be filled with grout.
- .3 Pipe Ramming
 - .1 The contractor shall prepare and submit a detailed description of the pipe ramming procedure including all construction techniques and requirements including erosion protection, shoring, excavation, dewatering, treatment,

steel casing progression, carrier pipe installation, grout material and grouting procedures.

- .2 The following information shall be provided to the Department Representative for review 5 working days prior to commencing pipe ramming operations:
 - .1 Lunch and reception shaft layout and dimensions,
 - .2 Equipment size, selection and layout of pipe ramming equipment at each pit,
 - .3 Work methodology and schedule,
 - .4 Access shaft details,
 - .5 Dewatering measures,
 - .6 Spoil removal system details,
 - .7 Detail calculations stamped and certified by a professional Engineer licensed in the Province of Ontario with a minimum of five years experience in the design calculations for the steel casing sizing and thickness to support the anticipated earth loads and superimposed live loads.
 - .8 Shop drawings for steel casing pipe.
- .3 Size of casing to be sufficient to house carrier pipe with appropriate annular space clearances to account for deviations in casing pipe installation while still permitting carrier pipe to be installed to indicated grades and inverts.
 - .1 Steel casing shall have an outside circumference which will be within one per cent of the nominal circumference or within 12.5 mm, whichever is less and shall have a maximum allowable straightness deviation of 3.2 mm in any 3m length of pipe in order that the circumference and straightness parameters do not hinder or obstruct the insertion of the carrier pipe.
- .4 Construction techniques required to provide entry and exit pits for pipe ramming shall ensure the safety of the work and the general public.
- .5 The contractor shall properly support all excavations and to prevent all movement of the soil, pavement, utilities and structure inside and outside of the excavation.
- .6 No pipe ramming work shall commence until the installation procedure has been reviewed by the Department Representative.
- .7 The contractor shall be responsible for monitoring ground movement associated with the pipe ramming work and make necessary adjustment in the installation methods to control ground movements and prevent damage to adjacent structures.
- .8 A lubrication system shall be provided that injects an approved lubricant into the inside and outside of the pipe to lower the friction developed on the sides of the pipe during ramming
- .9 The overcut on the steel casing shall be minimized not to exceed 25 mm and the annular space created by the overcut shall be filled with a grout that is suitable for the particular soil conditions.
- .10 Install carrier pipe inside the casing pipe to the lines and grades specified on the contract drawings.

- .11 Install end caps on the pipe casing and fill annular space between the casing pipe and the carrier pipe using grout.
- .12 Handle carrier pipe using methods approved by Departmental Representative and in accordance with manufacturer's installation instructions. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
 - .1 Pipe joints as indicated in Section 33 11 16. Pipe joints for Open Cut Pipe Installation will be permitted in this application provided they are fully secured against movement with retaining rings.

.4 Rock Bore

- .1 Either encased bore or non-encased bore procedures is permitted.
- .2 The contractor shall prepare and submit a detailed description of the rock bore procedure including all construction techniques and requirements including erosion protection, shoring, excavation, dewatering, treatment, diameter of bore, carrier pipe anchorage details, steel casing pipe thickness and diameter, carrier pipe installation, grout material and grouting procedures.
 - .1 The following information shall be provided to the Department Representative for review 5 working days prior to commencing rock bore operations:
 - .1 Lunch and receiving pit layout and dimensions,
 - .2 Equipment size, selection and layout of rock bore equipment at each pit,
 - .3 Work methodology and schedule,
 - .4 Access shaft details,
 - .5 Dewatering measures,
 - .6 Spoil removal system details,
 - .7 Where contractor chooses to leave the casing pipe in place after the bore is complete, provide shop drawings of the steel casing pipe conforming to OPSS 1802.
 - .2 Size of bore to be sufficient to house carrier pipe with appropriate annular space clearances to account for deviations in rock bore installation while still permitting carrier pipe to be installed to indicated grades and inverts.
- .3 Construction techniques required to provide entry and exit pits for pipe boring shall ensure the safety of the work and the general public.
- .4 The contractor shall properly support all excavations and to prevent all movement of the soil, pavement, utilities and structure inside and outside of the excavation.
- .5 No pipe boring work shall commence until the installation procedure has been reviewed by the Department Representative.
- .6 Where the steel casing is to be left in place after the rock bore is completed, the overcut on the steel casing shall be minimized not to exceed 25 mm and the annular space created by the overcut shall be filled with a grout that is suitable for the particular soil conditions.
- .7 Install carrier pipe inside the rock bore or casing pipe to the lines and grades specified on the contract drawings.
- .8 Plug ends of rock bore or casing and fill annular space between the carrier pipe using grout.

- .9 Handle carrier pipe using methods approved by Departmental Representative and in accordance with manufacturer's installation instructions. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .1 Pipe joints as indicated in Section 33 11 16. Pipe joints for Open Cut Pipe Installation will be permitted in this application provided they are fully secured against movement with retaining rings.

3.11 BOLLARD

- .1 Install bollards as indicated, embedded in and filled with concrete. Dome top of bollard with concrete.
- .2 Prior to painting clean exposed surfaces of bollard by removing rust, loose mill scale, welding slag, dirt, oil, grease and foreign substances.
- .3 Provide two (2) coats of paint for all exposed surfaces of bollards. Adhere to manufacturer's recommendations for application conditions and drying times.

3.12 SHORTAGE AND SURPLUS

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

END OF SECTION